

REMARKS

This application has been reviewed in light of the Office Action dated September 5, 2003. Claims 13-21 are pending in this application. Claims 13 and 14 are the independent claims. Favorable reconsideration is requested.

The Office Action states that Claims 15-18 are objected to, but would be allowable if rewritten so as not to depend from a rejected claim. Those claims have not been so rewritten at this time, however, because the corresponding base claim from which each depends is believed to be patentable.

Claim 20 was objected to under 37 CFR § 1.75(c) as allegedly being in improper form. However, the Office Action does not set forth clearly the reasons supporting this objection, other than the incomplete statement that the rejection has been made "because a multiple dependent claim 19."

In any event, Claim 20 depends from any one of Claims 13, 14, 17, or 18, each of which claims is in dependent (rather than multiply-dependent) form. Accordingly, Claim 20 is believed to be in proper dependent form, and withdrawal of the objection to that claim is therefore respectfully requested.

Claims 13, 14, and 19-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,184,610 (Shibata et al.) in view of U.S. Patent No. 6,147,449 (Iwasaki et al.).

Claim 13 is directed to an electron-emitting device comprising first and second electrodes arranged on a surface of a substrate, first and second carbon films, and

a voltage applier, for applying a voltage between the first electrode and the second electrode, to emit electrons. A first end of the first carbon film is electrically connected to the first electrode, and a first end of the second carbon film is electrically connected to the second electrode. A second end of the first carbon film and a second end of the second carbon film are disposed in opposition to each other across a gap, the second end of the first carbon film is more distant from the surface of the substrate than the second end of the second carbon film, and the voltage applier applies a potential greater than a potential of the second electrode to the first electrode in order to emit electrons.

Independent Claim 14 recites an electron-emitting device comprising first and second electrodes arranged on a surface of a substrate, first and second carbon films, and a voltage applier, for applying a voltage between the first electrode and the second electrode to emit electrons. The first carbon film is electrically connected to the first electrode, the second carbon film is electrically connected to the second electrode, and the first carbon film and the second carbon film are disposed in opposition to each other across a gap. An end of the first carbon film is more distant from the surface of the substrate than an end of the second carbon film, and the voltage applier applies a potential greater than a potential of the second electrode to the first electrode in order to emit electrons.

Fig. 21A of Shibata et al. depicts a substrate 1, a pair of device electrodes 2 and 3, and an electroconductive film 4 covered by a metal oxide coat 6 made mainly of MgO. Carbon 7 is deposited on and around an electron-emitting region as a result of an activation process. Carbon 7 does not completely cover the metal oxide coat 6 and the

surface of the metal oxide coat 6 is randomly exposed at a number of different areas. (Col. 29, lines 10-18).

While a relatively large amount of carbon 7 was deposited on a high potential side of the device by activation, a substantially same amount of carbon was deposited on both sides as shown in Fig. 21B. The electron-emitting device of this example has a metal oxide coat 6 mainly made of Y_2O_3 formed on the film 4 and the carbon 7 deposited by activation.

Fig. 21C shows a device in which a reference symbol "4+6" represents an electroconductive film containing a metal oxide material.

According to Shibata et al., a metal oxide film 6 is disposed on an electroconductive thin film 4, which is disposed on both of two electrodes 2 and 3. This is because, according to Shibata et al., the metal oxide film 6 coats the electroconductive film 4 for the purpose of suppressing the degradation of the electroconductive film 4 due to cohesion (see, e.g., col. 2, line 55 to col. 3, line 3). Further, a carbon film 7 is disposed on the metal oxide 6 on both of the electrodes 2 and 3.

Referring now to Iwasaki et al., beginning at col. 19, line 49 it is stated that, as a result of observation by SEM, it was confirmed that the coating film of W was formed on the high potential (positive electrode) side of the electron-emitting fissure for both the devices of Examples 1 and 2, as depicted in Fig. 13A. On the low potential (negative electrode) side, no appreciable coating film was found. According to Iwasaki et al., for some of the devices fabricated under the conditions similar to those in this example, a

slight coating film was also found on the low potential side depending on the conditions, as depicted in Fig. 13C.

According to Iwasaki et al., for the purpose of suppressing local melting and deformation of an electroconductive thin film due to heating the electron emitting area, a film 6 of a material of a higher melting point (rather than the electroconductive thin film 4) is disposed at an end (at a higher potential side) of the electroconductive thin film 4, positioned on the electron-emitting area (col. 3, line 66 to col. 4, line 39). Figs. 13B and 13C show an example in which a film 6 of a higher melting point material is disposed on the electroconductive film 4 on both of the electrodes 2 and 3. As the higher melting point material, metal oxide is also disposed (see col. 8, lines 8-33).

The Office Action states that “[i]t would have been obvious . . . to have manufacture the carbon film coating of Shibata according to the configuration of Iwasaki in order to provide a stable characteristics of electron emission and also has improved efficiency of electron emission and maintain excellent stability during operation.”

However, in Shibata et al. the carbon 7 covers the metal oxide coat 6 (Fig. 21A), the electroconductive film 4 (Fig. 21B), or the electroconductive film containing a metal oxide material (4+6), and, in Fig. 13A of Iwasaki et al., a slight coating was formed on the electroconductive film 4. Nothing in either of those references would teach or suggest an electron-emitting device in which an end of a first carbon film is more distant from the surface of a substrate than an end of a second carbon film, and wherein a greater potential than a potential of a second electrode electrically connected to the second carbon film, is applied to a first electrode electrically connected to the first carbon film, and

wherein a voltage applier applies a voltage between the first and second electrodes, as recited in Claims 13 and 14.

As such, even assuming *arguendo* if Shibata et al. and Iwasaki et al. were to be combined in the manner proposed in the Office Action, the resulting combination still would not teach or suggest those features. Accordingly, Claims 13 and 14 are each deemed clearly patentable over those references, whether considered separately or in combination.

The other claims in this application depend from one or another of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

The Office Action states that it had been made “final” because Applicants’ previous amendment necessitated a new ground of rejection. However, the Amendment of August 7, 2003 merely clarified in the independent claims that a voltage applier applies a voltage between the first and second electrodes. Those claims previously already recited that the electrodes had potentials, and thus the clarifying amendments made in the August 7, 2003 Amendment are not believed to have raised any further issues or require a further search. Accordingly, it is believed that the August 7, 2003 Amendment did not necessitate any new ground of rejection. In view of the above, the Examiner is respectfully requested to withdraw the finality of the Office Action.


Nonetheless, if the Examiner disagrees, this Amendment is believed clearly to place this application in condition for allowance and its entry is therefore believed

proper under 37 C.F.R. § 1.116. In any event, however, entry of this Amendment, as an earnest effort to advance prosecution and reduce the number of issues, is respectfully requested. Should the Examiner believe that issues remain outstanding, he is respectfully requested to contact Applicants' undersigned attorney in an effort to resolve such issues and advance the case to issue.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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